State and Federal Applications for Renewal of the Trans Alaska Pipeline System

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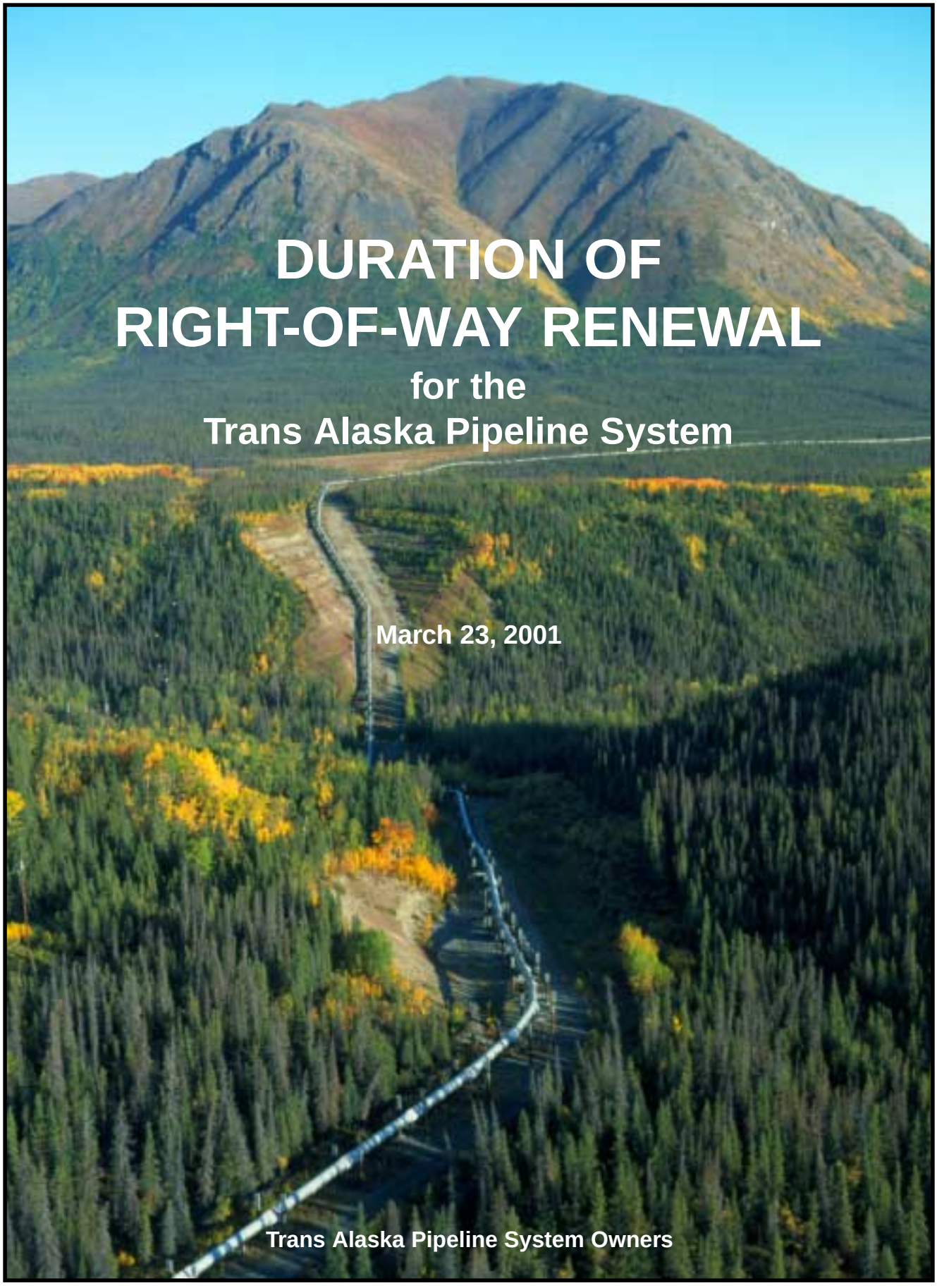

DURATION OF RIGHT-OF-WAY RENEWAL

for the Trans Alaska Pipeline System

March 23, 2001

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IMPORTANT NOTE

The authors of this report have made every effort to gather complete and accurate data for their analysis. Projections of future TAPS throughput and configuration, North Slope oil development, gas commercialization, and tanker transportation are necessarily dependent on assumptions about oil and gas production, future technology, and the facilities and equipment needed. The authors' assumptions represent informed projections based on knowledge of current operations and are not meant to imply that these predictions completely and accurately reflect all future scenarios pertaining to TAPS, North Slope oil and gas development, or tanker transportation. Actual outcomes are dependant on many variables including the economics of oil and gas production, changing laws and regulations, and political realities, and may differ significantly from those predicted here.

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1. Introduction

The Trans Alaska Pipeline System (TAPS) has transported over 13 billion barrels of Alaska North Slope crude oil since it was opened in 1977. The pipeline currently carries nearly 20 percent of all crude oil produced in the U.S., and it will continue for decades to provide a critical link in the supply of a significant share of the nation's crude oil.

In its 800-mile length from the North Slope oil fields to the port of Valdez, the pipeline crosses hundreds of miles of state and federal land. Before constructing and operating the pipeline on those lands, the TAPS Owner companies were required to obtain long-term, renewable rights-of-way from the government land management agencies. These rights-of-way, issued in 1974 for 30-year terms, must be renewed before their expiration in 2004. The TAPS Owners' application for renewal of these federal and state rights-of-way seeks the maximum terms for the renewals.

The requirements contained in the federal and state laws governing the renewal of pipeline rights-of-way are similar: if the pipeline is in commercial operation at the time of renewal, and complies with applicable legal requirements, the pipeline Owners are entitled to renewal. As a rule, renewal of pipeline rights-of-way for the maximum permissible term is perfunctory and non-controversial. This reflects three related aspects of crude oil pipelines and the role of the rights-of-way in their governance.

- First, properly designed and maintained pipelines can provide safe service almost indefinitely.
- Second, the very large capital investment in pipelines and strong public interest in their continued operation establish a legitimate public policy favoring renewals.
- Lastly, rights-of-way by their nature express long-term public land-use commitments.

Actual day-to-day regulation of pipelines is accomplished by a large and regularly updated body of laws and regulatory oversight activities.

In considering the length of a renewal term, federal and state right-of-way laws invoke several criteria — the useful life of the pipeline, its public purpose, and its cost. Because the public purposes served by the trans-Alaska pipeline are clear and its costs readily understood, this report will treat these considerations only briefly. The principal focus of this report is the useful life of the pipeline, which comprises both physical and economic utility. The physical life span of a pipeline is determined by both the quality of its original design and its upkeep. The economic life of a crude oil pipeline is determined by how long it can provide service and provide its owners with a reasonable return.

As this report demonstrates, the useful life of TAPS will extend well beyond 30 years. The Trans Alaska Pipeline System was built to have a long life notwithstanding the extremes and uncertainties of the Alaska environment. It was designed to meet exacting specifications, incorporating a considerable margin of safety and conservative engineering. The maintenance of the system is unparalleled; TAPS surveillance, corrosion, and integrity programs are state-of-the-art and assure that the pipeline will continue to provide safe service indefinitely.

The economic life of the pipeline is limited only by recoverable North Slope crude oil reserves. Using reasonable estimates by government agencies, more than sufficient crude oil will be available to keep the pipeline viable for well in excess of 30 years — without including areas that are presently closed to oil exploration and development.

As this report demonstrates, TAPS clearly meets all federal and state criteria for right-of-way renewal for a maximum term, since it will continue to function safely through and beyond a 30-year renewal period and to deliver a crucial percentage of U.S. crude oil production. Furthermore, shortening the renewal period would serve no public purpose and might well have a chilling effect on future investment in Alaska oil and gas development.

Underlying this report is the recognition that the trans-Alaska pipeline is an unusually important facility that has attracted public attention and intense regulatory scrutiny throughout its life. This report is one element of a series of documents that the TAPS Owners have commissioned to assure the public and regulatory community that the right-of-way renewals are well supported and that all interested parties have ready access to essential information.

2. Purpose and Organization of this Report

The purpose of this report is to demonstrate that the duration of the federal *Agreement and Grant of Right-of-Way for Trans-Alaska Pipeline* (Federal Grant) and the Alaska *Right-of-Way Lease for the Trans-Alaska Pipeline* (State Lease) renewals should be 30 years. This report clearly indicates that TAPS has a useful life well in excess of 30 years. It serves national security, critical state and federal economic needs, and other important public purposes. In addition, 30-year renewal is important to assure long-term transportation capability for existing and potential future North Slope oil production. The size of investments needed to support this production require this stability. Furthermore, the substantial costs associated with the renewal process itself argue for maximum renewal duration. Finally, the renewal process is not essential to change the Federal Grant and State Lease documents, since these agreements are required to allow changes on an as-needed basis.

Accordingly, this report shows that TAPS meets the three express federal and state TAPS right-of-way renewal-duration criteria: useful life, public purpose, and facility cost justifying maximum renewal duration. The report is organized to present, in order, the detailed arguments about useful life, public purpose, and cost, interspersed with information on the remaining duration issues. The discussion of useful life is the most detailed and is divided into separate consideration of the physical and economic life span of the pipeline. The discussion of the physical integrity of TAPS and why it is not a limit on useful life requires technical description of pipeline components, and their maintenance and repair, and much of that technical detail is included in the appendices.

Alyeska Pipeline Service Company

***Photo 1**. Elevated pipeline along the southern part of TAPS.*

3. Background

TAPS is the sole existing means to transport crude oil from Alaska's North Slope oil fields to the port of Valdez (Figure 1), where the oil is loaded onto tankers for marine delivery to U.S. refineries or export markets. TAPS comprises the 800-mile 48-inch pipeline, the Valdez Marine Terminal, and associated facilities such as pump stations, tanks, access roads, and offices. Alyeska Pipeline Service Company (Alyeska) operates TAPS on behalf of the Owner companies.

After the discovery of the Prudhoe Bay oil field in 1968, various options to transport the oil to market were explored. The chosen option — a pipeline from the North Slope to Valdez and marine transportation from Valdez to markets — was first proposed in 1969, but legal challenges delayed the start of construction. In 1973, Congress assured the existence of TAPS when it enacted the Trans Alaska Pipeline Authorization Act (TAPAA), which established specific requirements for the construction and operation of the system. Construction commenced in 1974, and operations began in 1977.

TAPS cost approximately $8 billion (in 1977 dollars), took 3 years to build, and was one of the largest construction projects ever completed. Prior to the construction of TAPS, a six-volume environmental impact statement (EIS) was prepared which incorporated 1,300 studies and required 175 person-years to complete. The construction and continued operation of TAPS required the acquisition of, and compliance with, over 1,000 permits and other governmental authorizations.

Of the 800 miles of mainline pipe, approximately 376 miles are on federal land, 344 miles cross state land, and 80 miles are on property owned by other entities, including, notably, lands owned by Alaska Native entities and lands owned in fee by TAPS Owners. For example, the Valdez Marine Terminal (VMT) and Pump Stations 1, 8, and 9 are located on land owned in fee by the Owners.

TAPS currently transports about 1 million barrels of crude oil per day, almost 20 percent of total domestically produced capacity. Although several major North Slope fields (Figure 2) are declining, estimates of future production show that TAPS will continue to transport nationally significant quantities of crude oil for decades (TAPS Owners, 2001, Appendix A), and TAPS has been designated an asset essential to national security. Over its quarter century of operating history, TAPS has amassed an enviable record of reliability, environmental performance, and safety.

TAPS is a complex system. In addition to the 800 miles of mainline pipe, the system's major components include 11 pump stations (only six of which are now in operation); the VMT; a natural gas supply system; tanks; valves; operations control, communications, and leak and fire detection and control systems; roads, pads, and remote residential quarters; and a host of associated facilities and equipment.

TAPS transports all of the oil produced from more than a dozen Alaska North Slope oil fields located principally on state mineral leases. Wells produce an oil/gas/water mixture, which is separated before the oil is sent to Pump Station 1 at Prudhoe Bay, where it enters the pipeline system. A small portion of the crude oil stream is diverted to three Alaska refineries located near Fairbanks and in Valdez, which produce refined products for in-state consumption and export. When the crude oil reaches Valdez, it may be stored in large tanks at the VMT or loaded directly onto tankers for shipment to refineries along the U.S. West Coast or in Hawaii, the U.S. Virgin Islands, or the Far East.

The initial design of TAPS incorporated innovative engineering concepts and robust components to ensure its

J. Lukin

Photo 2. *Installation of below-ground pipe during TAPS construction.*

Figure 1. *State of Alaska map showing place names and trans-Alaska pipeline route.*

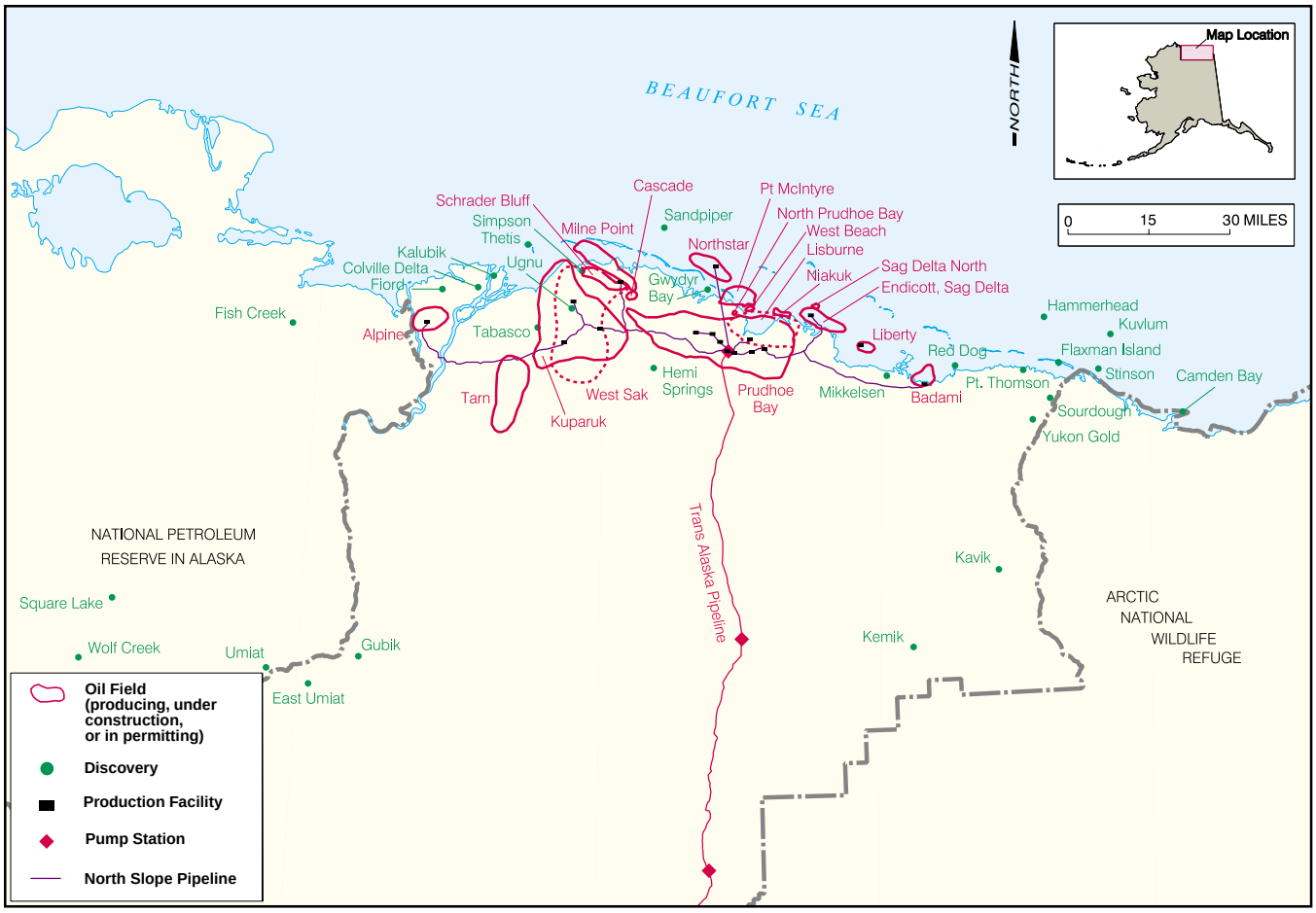

Figure 2. *Alaska North Slope oil fields.*

lasting service in an arctic/subarctic operating environment. For example, seismic and permafrost conditions led to unique pipe and welding specifications and an innovative pipeline support system, the combined performance of which has been unexcelled. Over almost 25 years, many of the TAPS components and operating systems have been modified, replaced, or upgraded to ensure pipeline system safety, integrity, and efficiency. Programs to detect and repair wear, corrosion, and other forms of damage have been implemented and improved.

The operation of TAPS by Alyeska requires about 2,000 people, including contractors. The chief goals of this workforce are to ensure the safety, environmental performance, and integrity of the system while maintaining reliable and efficient deliveries of crude oil to Valdez. In these activities, Alyeska has worked side by side with federal and state regulatory personnel dedicated to TAPS and devoted to ensuring that TAPS is operated in accord with an extensive and constantly evolving array of statutory and regulatory requirements. TAPS has thus been the subject of a uniquely stringent and thorough system of regulatory oversight, which has ensured that all of its operations receive constant scrutiny, accompanied by significant public involvement.

4. The Legal Foundation for the Renewal Duration of the TAPS Rights-of-Way

To deliver essential supplies of energy, pipelines frequently must be built across public lands. In recognition of the critical public need that these facilities serve, Congress and the states have adopted a series of constitutional, statutory, and regulatory provisions to permit pipelines to acquire long-term rights-of-way over public lands. Accordingly, in the Mineral Leasing Act of 1920[1] (MLA), Congress delegated authority to the Department of the Interior to grant pipeline entities the right to build and operate pipelines across federal lands. The State of Alaska's Right-of-Way Leasing Act[2] was enacted to provide similar authority to its land management agency, the Department of Natural Resources. These two laws generally allow agencies to grant pipelines long-term renewable rights to use the public land, but impose stringent conditions, relating to a broad variety of topics, on the construction and operation of pipelines.[3]

The construction and operation of TAPS were authorized in 1973 by Congress in TAPAA.[4] TAPAA incorporated a large array of provisions specifically aimed at expediting construction of TAPS and was also geared to ensuring that construction and operation of the line met the highest construction, environmental, and safety standards. As part of TAPAA, Congress amended the MLA to incorporate provisions that governed the initial grant and renewal of all pipeline rights-of-way over federal lands, and made the issuance and renewal of the TAPS right-of-way subject to those provisions.[5] The section of the MLA that governs the duration of pipeline rights-of-way provides:[6]

> (n) Duration of Grant. Each right-of-way or permit granted or renewed pursuant to this section shall be limited to a reasonable term in light of all circumstances concerning the project, but in no event more than thirty years. In determining the duration of a right-of-way the Secretary [of the Interior] or agency head shall, among other things,[7] take into consideration the cost of the facility, its useful life, and any public purpose it serves. The Secretary or agency head shall renew any right-of-way, in accordance with the provisions of this section, so long as the project is in commercial operation, and is operated and maintained in accordance with all of the provisions of this section.

The Right-of-Way Leasing Act of the State of Alaska similarly provides that a right-of-way lease shall be renewable:[8, 9]

> . . . so long as the lessee is in commercial operation and is in full compliance with all state law, including but not limited to state law pertaining to regulation

[1] The pipeline right-of-way provisions appear in Section 28 of the Mineral Leasing Act, 30 USC 185.

[2] AS 38.35.110.

[3] In the MLA, these conditions include, but are not limited to, requirements relating to pipeline safety, environmental protection, technical and financial capability, common carriage, and liability. Additional conditions are imposed by the State of Alaska and by Congress in TAPAA, discussed below.

[4] 43 USC 1651 *et seq*. Section 1652(b) reads: "The Congress hereby authorizes and directs the Secretary of the Interior . . . [and other officials] to issue and take all necessary action to administer and enforce rights-of-way, permits, leases and other authorizations that are necessary for or related to the construction, operation, and maintenance of the trans-Alaska oil pipeline system . . . [as described in the 1972 EIS]."

[5] Section 1652(c) reads: "Rights-of-way, permits, leases, and other authorizations issued pursuant to this chapter [i.e., TAPAA] shall be subject to the provisions of section 185 of title 30 [the section of the MLA dealing with pipeline rights-of-way] as amended by Pub. L. 93-153 [TAPAA] . . . ; all authorizations issued by the Secretary . . . [and other officers] pursuant to this chapter shall include the terms and conditions required, and may include the terms and conditions permitted, by the provisions of law that would otherwise be applicable [i.e., the MLA] if this chapter had not been enacted [excepting certain procedural and other requirements of the MLA which would duplicate or conflict with specific provisions of TAPAA] . . .

[6] 30 USC Section 185(n), which is Section 28 of the MLA.

[7] "Among other things" is not anywhere defined. As discussed below, the unique legal framework governing TAPS is an important factor to be taken into consideration which justifies long-term renewal. The federal regulations regarding MLA Section 28 right-of-way grants add a fourth possible criterion — "potentially conflicting uses of the land" [43 CFR Section 2881.1-1(e)(4)]. This issue does not appear to be relevant to TAPS, since the pipeline corridor has been dedicated to long-term pipeline use. Conflicting land use is thus not discussed further.

[8] AS 38.35.110.

[9] The Federal Grant was issued January 23, 1974. The State Lease was issued May 3, 1974. Both rights-of-way were initially issued for 30 years. Federal law — the MLA — permits 30-year renewals. The shorter state renewal term (10 years) is in the process of amendment to parallel the federal term.

and taxation of the pipeline facility, and is in compliance with all terms of the lease. In making this determination, the commissioner shall take into account the cost of the proposed pipeline, its useful life, and the probable financing requirement of the proposed pipeline.

Other than this statutory language itself, there is very little in the way of legislative history, regulatory guidance, or judicial precedent available to assist in interpreting the meaning of either the federal or state provisions on duration or explanation of the specified factors to be taken into consideration. However, federal rights-of-way are typically approved for maximum terms, unless the applicant has requested a shorter term.[10] This practice appropriately recognizes the large capital investments made based on the expectation that the right of use will be maintained and the public interest in continuing the services pipelines provide.

While the term "useful life" is not defined in the applicable laws or regulations,[11] the useful life of TAPS seems clearly meant to describe the remaining life of the pipeline, which is a function both of its physical life span and its economic utility. The physical life of the pipeline is determined principally by the nature of its original design and subsequent maintenance, repair, and replacement activities. The economic life of the pipeline is determined by how long it provides reasonable return, considering original investment and operating costs.

While the cost[12] and public purpose criteria also are not defined in the laws or regulations, they seem fairly self-evident. Cost is a question of how much is and will be invested in the pipeline, and public purpose goes to whether the pipeline aids in accomplishing recognized public policy goals.

To exercise these rather broadly-stated criteria in the process of fashioning a long-term renewal of the Federal Grant and State Lease, the authorizing agencies must consider established principles of administrative law, as well as the unique features of the current agreements, which make significant alteration of the Federal Grant and State Lease, including their terms, unnecessary.

The regulations and handbook of the Department of the Interior's principal land management agency, the Bureau of Land Management (BLM), briefly treat right-of-way management, including renewals. Although they largely repeat the statutory language, one section of the BLM handbook [2801(G)(3) *et seq.*] addresses the discretion agency personnel may exercise in making changes to an existing grant during renewal. It instructs that: ". . . grants providing for renewal may not be modified without good cause and/or the holder's consent. Generally, only conditions created by new law and/or involving major health and safety conditions will be considered good cause."

Under customary and settled principles of both federal and state administrative law, the discretion afforded agency officials by statute to set the duration terms must be exercised reasonably, be tailored to the circumstances of each applicant's project, weigh the important property right involved, and respect precedent. If there is no clear justification for setting a shorter period than the maximum, the interest of the right-of-way holder and the public in a long-term authorization should be persuasive.[13]

Additionally, consideration of changed or new grant provisions is not necessarily part and parcel of the renewal process. The Federal Grant, State Lease, and statutes give regulatory authorities ample discretion to modify requirements and to require TAPS to update and change its operations to meet health, safety, environmental protection, and other standards whenever those changes are warranted.[14] This discretion appears to be unique to TAPS.

The legal and regulatory apparatus that governs the day-to-day operations of TAPS, as well as most aspects of its long-term existence, is comprehensive and exists largely independent of, and alongside, the Federal Grant and State Lease. Both TAPAA and MLA command compliance with a broad variety of safety, integrity, and environmental requirements. TAPAA applied a special strict liability scheme

[10] While there are no statistical data available on grants of renewal, as of 1999, the Bureau of Land Management was overseeing in excess of 87,000 right-of-way grants across the nation and annually processing between 3,000 and 4,000 actions. While the agency charges a fee for original applications, until a 1999 rulemaking, it did not propose to charge for renewal.

[11] "Useful life" is defined legally in several other contexts, including the Internal Revenue Service regulations [e.g., 26 CFR 1.167(a)(1)], which confirm the central idea of useful life as an estimate of how long a piece of property will remain serviceable and continue to generate income.

[12] The state criterion on costs (i.e., probable financing of the proposed pipeline) would appear to refer to a similar inquiry, although it is not defined.

[13] Agency decisions require coherent and reasoned justification. Unexplained departures from existing practices are impermissible. See Davis & Pierce, Administrative Law Treatise, 1994, Sections 11.1, 11.2 and 11.5.

[14] TAPAA provides, in 43 USC Section 1652(e), that authorized federal officers may modify "at any time when necessary to protect the public interest . . . any right-of-way, permit, lease or other authorization." Stipulation 1.3.2 of Exhibit D to the Federal Grant allows the Authorized Officer to require modifications of TAPS "as he deems necessary to protect or maintain stability of geologic materials; protect or maintain the integrity of the pipeline system; prevent serious and irreplaceable harm to the environment (including but not limited to fish or wildlife populations or their habitats); or remove hazards to public health or safety."

to TAPS activities and established a corresponding liability fund derived from a levy on the crude oil transported by the system. TAPS has in excess of 1,000 federal and state permits and authorizations under separate laws such as the Clean Air Act, Clean Water Act, Resource Conservation and Recovery Act, Oil Pollution Act of 1990, Occupational Safety and Health Act, and corresponding state laws. The Office of Pipeline Safety of the U.S. Department of Transportation administers pipeline safety legislation whose provisions directly govern TAPS integrity and operations.

Regulatory oversight is equally comprehensive. The Joint Pipeline Office (JPO), a unique collaboration of federal and state agencies, was set up in 1990[15] to provide full-time regulatory support and oversight to TAPS. Both the JPO and Congress have actively and continually monitored TAPS compliance, and the JPO and its constituent agencies have diligently enforced legal and regulatory requirements. Both the JPO and Alyeska have conducted major audits of the pipeline system, and the findings of those audits have led to significant improvements in TAPS.

In summary, agencies need not limit duration of the renewal period to ensure compliance with requirements for safety, health, environmental protection, and system integrity. The Federal Grant and State Lease provide adequate flexibility for changes (Stipulation 1.3.2).

[15] Prior to formation of the JPO, oversight similar to construction oversight was performed by the Alaska Pipeline Office (Federal) and the State Pipeline Coordinator's Office (state).

5. Useful Life of the Trans Alaska Pipeline System

Useful life is one of the three primary elements for establishing the duration of the federal and state rights-of-way. For purposes of this document, *useful life* is defined as a combination of *design life, physical life,* and *economic life.* The useful life of TAPS can be portrayed as the period during which the pipeline provides a safe, environmentally sound, economically viable transportation link to get Alaska North Slope crude oil to market.

TAPS useful life will continue well beyond the maximum allowable 30-year right-of-way renewal because:

- TAPS design life is based on the incorporation of robust components and the accommodation of repair, replacement, and state-of-the-art updating strategies, including system monitoring and environmental protection methods designed to counteract aging and time factors.
- TAPS physical life is considered virtually unlimited given the execution of appropriate surveillance, maintenance, repair, and replacement programs. TAPS was constructed, and is maintained, to ensure its integrity well in excess of the proposed 30-year renewal term.
- TAPS economic life is governed by the extent of recoverable North Slope crude oil reserves. Predictions show these reserves being produced in quantities sufficient to support the continued operation of the pipeline well beyond 30 years.

The succeeding sections discuss, in turn, design life, physical life, and economic life in more detail.

5.1 Design Life

Engineers developed design criteria for TAPS based on assumptions that protection of the Alaska environment was paramount and that, as the only oil transportation link to Alaska's North Slope, the pipeline had to function reliably and safely, with sufficient structural integrity to resist arctic conditions over an indeterminate period. These significant technical challenges resulted in a design that incorporates many redundancies and safety factors to account for known and unpredictable future conditions. The pipeline design was intentionally robust, and 25 years of operation have provided the opportunity for a critical evaluation of the design assumptions and features. That evaluation has confirmed that the design decisions were correct.

Key TAPS design features addressed technical challenges such as support of a warm-oil pipeline in permafrost (Figure 3) and seismic risks to pipeline integrity. Design elements included assumptions and features that anticipated the effects of aging, such as:

- Estimates of thaw settlement allowances for buried pipeline segments,
- Pipe movement allowances in the above-ground design to provide for crude-oil temperature changes over time, and

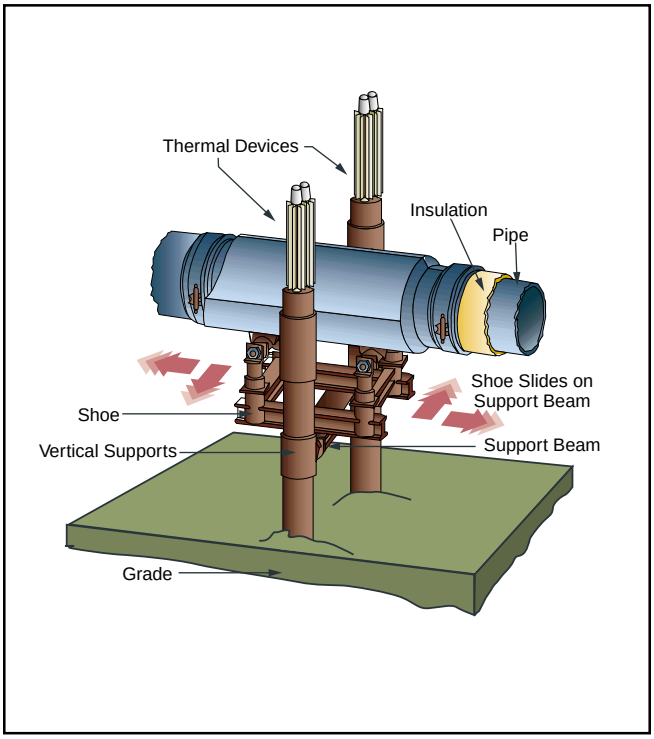

Figure 3. *Approximately half of the pipeline is supported on specially designed supports to ensure the integrity of the warm-oil pipeline in permafrost. The supports consist of crossbeams installed between vertical support members placed in the ground. The above-ground pipe is insulated, jacketed with galvanized steel, and mounted on a Teflon-coated shoe that can slide back and forth on the crossbeams.*

- Soil creep or frost jacking at above-ground pipe supports.

TAPS performance is evidence that the design tolerances and protective features have been more than adequate to meet the challenges. Pipeline integrity has been stable, and age-dependent issues have been manageable over time. Buttressing the design features are surveillance and monitoring programs that continually assess the viability and functioning of the system and gauge the status of the pipeline system against the original design standards. Maintenance and repair programs keep TAPS in a safe, reliable state that protects the surrounding environment from adverse impacts from TAPS operations.

While some early statements regarding the intended service life of the pipeline estimated 30 years, in fact the pipeline design was not based on retirement or cessation of operations 30 years from the start of operations in 1977. These statements are derived from original estimates of the life of the proven Prudhoe Bay field reserves (Norman, 1971), which were used to justify the field owners' decision to proceed with TAPS construction. However, given the size of the Prudhoe Bay field, the possibility of further North Slope discoveries, and the consequences of a design failure, the pipeline was designed and built so that it could be physically operated indefinitely while meeting all safety and environmental criteria. Of course, Prudhoe Bay has produced far more reserves and has a far longer life span than originally predicted. Moreover, other significant North Slope fields have been, and still are, being developed. The original design goal — to incorporate features which would facilitate a virtually unlimited useful life of the system — was well selected.

In fact, the initial duration of the Federal Grant and State Lease was set at 30 years because that was the maximum period allowed by law, not because of any concern that the pipeline system would not last longer than 30 years.

5.2 Physical Life

TAPS physical life will last as long as the integrity of the pipeline and facilities is maintained adequately to allow continued safe and environmentally sound transport of crude oil. Alyeska possesses one of the industry's most rigorous maintenance programs, key aspects of which are continual monitoring and replacement of TAPS components, where advisable, either to ensure system integrity or to take advantage of technological improvements and efficiencies. Just one indication of the massive nature of that program is the approximate $25 million to $50 million spent each year to detect and control corrosion.

TAPS is proven to be reliable — from July 28, 1977, through December 31, 2000, the pipeline operated for over 204,000 hours and was shut down for a total of only 852 hours, giving it a reliability rate of 99.6 percent. The pipeline also has an excellent performance record with respect to leaks — since startup, over 13 billion barrels of crude have been transported, with only 5 major leaks (i.e., greater than 1,000 barrels) on the mainline pipeline totaling approximately 23,500 barrels, one-half of which occurred through a single sabotage incident at Steele Creek. The expectation is that these results will be improved on in the future, given diligent upkeep and further developments in such areas as smart pigs and leak detection technology which Alyeska has pioneered in past years.

Since startup of TAPS in 1977, Alyeska has continued to improve and expand its initially comprehensive programs to detect and repair potential problems that might threaten the integrity of the pipeline system. Alyeska has developed innovative, state-of-the-art methods to monitor the condition of the pipeline and associated facilities. Where corrosion, settling, or other problems have been detected, prompt repairs — including the replacement of several sections of mainline pipe — have been made. These programs verify that the initial design specifications and construction methods were robust and lasting even in harsh arctic conditions.

In addressing TAPS longevity, it is useful to compare the TAPS operating period with that of other pipelines. These comparisons reveal that pipeline age is not a reliable indicator of pipeline operating risk — assuming good design and maintenance. A number of pipelines have been in good operating condition for more than 50 years (Muhlbauer, 1996).

A study of Cook Inlet, Alaska, oil pipeline performance performed by the Alaska Department of Environmental Conservation (ADEC) noted (Visser et al., 1993):

> The fact that the pipelines have reached their original design life does not imply that the lines have become inadequate or unsafe. The integrity of an older pipeline is a function of how well the line has been maintained, the type of throughput, and how the current operating conditions compare with the original design conditions. With proper maintenance the remaining life of a pipeline can be several multiples of the original design life.

Appendix 2 discusses pipeline longevity studies, potential age-related threats to pipeline integrity, and measures to mitigate those threats.

5.3 Economic Life

The economic life of TAPS is essentially determined by whether there is sufficient North Slope crude oil economically available to justify continued operation of TAPS. It is clear that there is more than enough physically recoverable oil to continue to operate TAPS through the 30-year renewal period.

U.S. government and State of Alaska predictions of North Slope oil production show that, although production from current fields will continue to decline, by 2020 production will level off in the range of 500,000 barrels per day until the end of the period in 2034.[16] These conservative estimates are based principally on well-established decline curves for existing fields[17] and on a small increment in future production to be supplied by increased production from existing fields and by production from very modest discoveries. The estimates do not include the assumption that any oil will be produced from new major discoveries or from areas that are currently closed to exploration and production. More than sufficient economically recoverable oil is available to support the operation of the pipeline beyond 30 years.

Currently, TAPS throughput is about 1 million barrels per day (bbl/day). At pipeline startup in 1977, throughput was about 300,000 bbl/day, and at peak operation in 1988, throughput was over 2 million bbl/day. Two conclusions can be drawn from this operating experience: 1) TAPS has already operated in the throughput ranges expected during the duration period, and 2) since throughput has decreased by over 1 million bbl/day in 12 years, dealing with an additional decline of 700,000 bbl/day in the next 30 years is well within technical and operating abilities.

Alyeska has made, and continues to make, changes to accommodate lower throughput. There is no expectation that these changes — or those needed to reach even much lower levels — would be determinative or critical in deciding whether to keep TAPS open. At some point, obviously, it would be both physically and economically impossible to continue to operate TAPS. That level is indeterminate, but is much lower than any reasonably anticipated throughput expected during the proposed 30-year renewal period.

Moreover, since TAPS is the only existing method to transport Alaska North Slope crude oil to market, it is very likely that the oil-producing companies and the State of Alaska, as a royalty owner, would favor the long-term duration of TAPS to avoid stranding significant quantities of crude oil in the earth. The history of technological change in both the pipeline and oil exploration and production industries provides reason for optimism on this score. Innovation, coupled with reduced costs, have meant that both pipeline transportation and the finding and extraction of oil have been steadily improved.

[16] Appendix A of the draft *Environmental Report for Trans Alaska Pipeline System Right-of-Way Renewal* (TAPS Owners, 2001) contains a detailed analysis of TAPS throughput assumptions. In addition, recent estimates by the Alaska Department of Revenue predict North Slope production will exceed 1 million barrels per day through 2010 — the last year of the Department of Revenue analysis.

[17] Oil fields customarily have long production "tails," that is, they produce at reduced, but stable and predictable levels for a long time. These predictable tails will supply the basic level of TAPS throughput over the next three decades.

6. Current Performance

In considering the duration for the renewal term, it is helpful to examine the current performance of TAPS in the areas of safety, reliability, and spills.

6.1 Safety

Alyeska safety-incident rates (Table 1) are consistently better than national rates for general industry and generally better than pipeline-industry rates (Figure 4). Contractor incident rates were comparable to other pipeline-company averages for 1997 and 1998. In 1994 through 1998, Alyeska and its contractors received safety achievement awards from the Governor's Safety Conference.

6.2 System Reliability

Reliability is measured by the percentage of time TAPS is in operation. The reliability goal is to use the preventive maintenance program to maintain a reliability rate of 99.5 percent or better (not including down time due to weather and planned shutdowns). To date, Alyeska has met this target. From July 28, 1977, through December 31, 2000, the pipeline operated over 204,000 hours and was shut down 105 times for a total of 852 hours. This is a reliability rate of 99.6 percent.

Shutdown lengths have ranged from 7 minutes to 110 hours. Most of these shutdowns were planned to accommodate scheduled maintenance. In 1983, 1988, and 1991, there was no down time, planned or unplanned (Figure 5).

Shutdowns have increased some since 1994 because of two changes in operations, both related to operating philosophy and not threats to system integrity. Shutdowns are now required during each remote-gate-valve communication failure lasting longer than two minutes, and Alyeska now schedules needed shutdowns of the pipeline rather than postponing repairs until producer shutdowns.

6.3 Spills

The pipeline has an outstanding performance record with respect to leaks. Since startup, over 13 billion barrels of oil have passed through TAPS, but there have been only five major leaks (i.e., >1,000 barrels) on the mainline pipe totaling approximately 23,500 barrels (0.00018 percent of total throughput). Of this spill total, over half (16,000 barrels) was due to a single sabotage incident at Steele Creek in 1978, as shown below:

- Steele Creek 16,000 bbl
- Milepost 734 4,000 bbl
- Check Valve 23 2,000 bbl
- Check Valve 7 1,800 bbl
- Atigun Pass 1,500 bbl

6.3.1 Pipeline Spill Prevention and Response

The *TAPS Oil Discharge Prevention and Contingency Plan* (APSC, 2000a) is updated regularly. On November 30, 1998, the JPO and ADEC approved the current plan for

Table 1. *Alyeska and contractor safety rates per 200,000 hours worked.*

	ALYESKA		CONTRACTORS		COMBINED	
	Recordable	Lost-Time	Recordable	Lost-Time	Recordable	Lost-Time
1997	1.56	0.67	2.05	0.19	1.93	0.31
1998	2.10	0.58	2.10	0.57	2.10	0.57
1999	2.15	0.72	1.77	0.59	1.88	0.63
2000	1.89	0.89	1.95	0.50	1.93	0.60

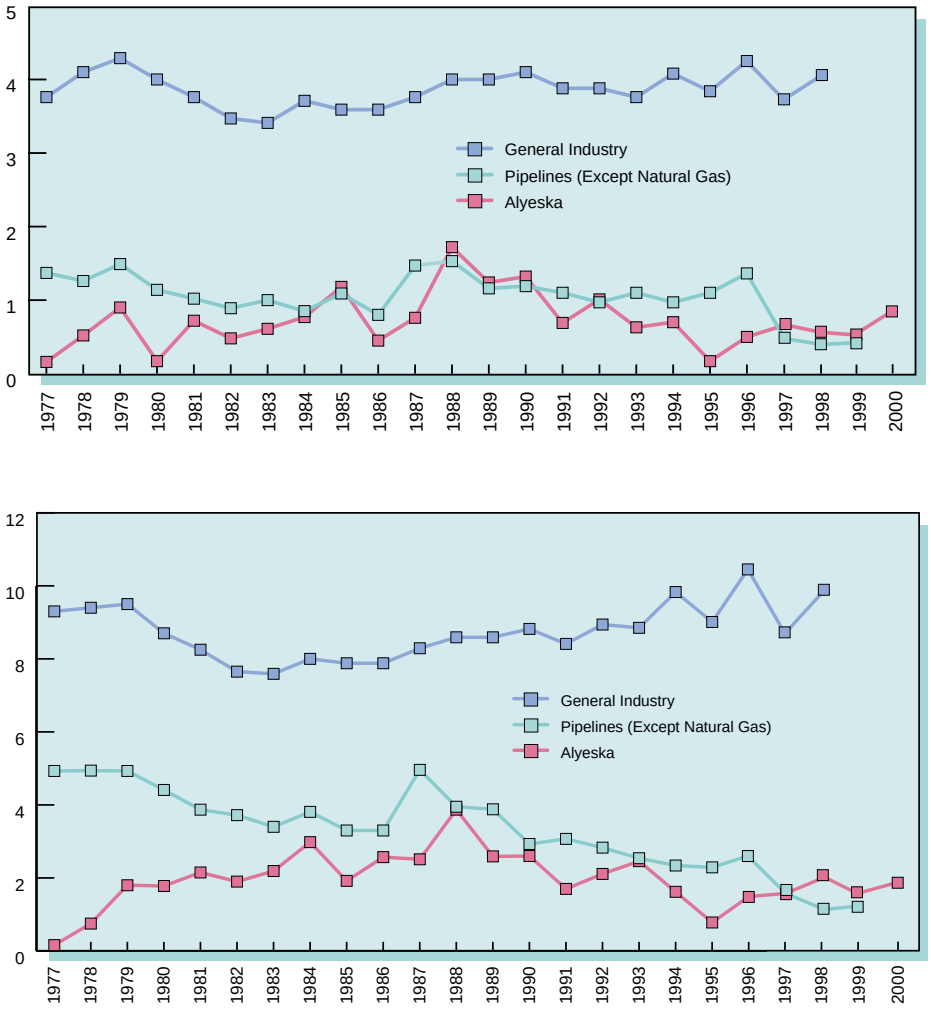

Figure 4. *Lost-time incident rates (top) and OSHA recordable rates (bottom) for Alyeska employees, pipeline industry, and general industry (cases per 200,000 hours worked).*

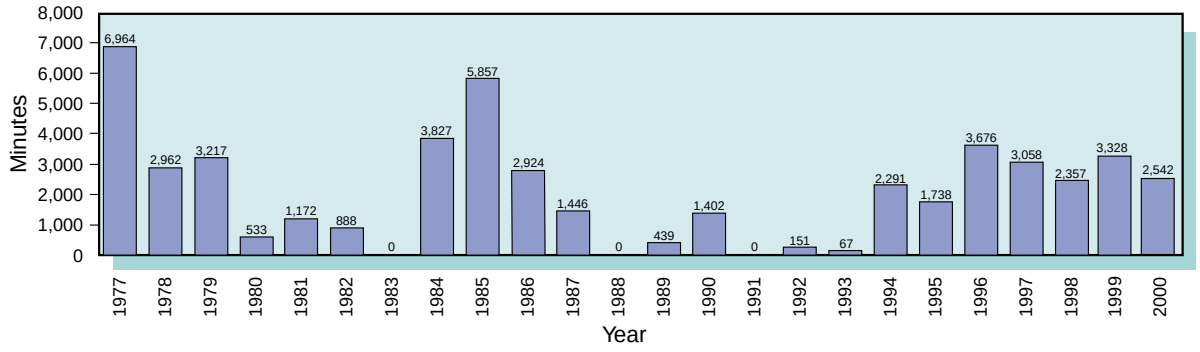

Figure 5. *Length of TAPS shutdowns, 1977 through 2000.*

renewal. The current revision of the plan provides greater safeguards to people, facilities, wildlife, and the environment along TAPS. The plan includes the following:

- New electronic capabilities which allow detection and location of smaller pipeline leaks (as a percentage of throughput), thus shortening response time and minimizing spill volumes;
- Improved leak detection and leak prevention alarm systems for pump station tanks; and
- Improved aerial photographs of the pipeline to aid in spill response planning.

6.3.2 Marine Spill Prevention and Response

The foundation of the Prince William Sound oil spill prevention program is the tanker escort system described in Appendix 6. Although the focus of the rights-of-way renewal is on pipeline use of federal and state property, the pipeline system actually extends from Pump Station 1 to the Valdez tanker-loading facilities, and further includes tanker ship escort and spill response throughout Prince William Sound to Hinchinbrook Entrance, which is the entry point to the sound.

7. Future Challenges

Over the next 30 years, TAPS will continue to adapt to meet new challenges. These challenges include declining throughput and enhancement of surveillance and maintenance activities to ensure TAPS integrity.

Alyeska has already flexibly adjusted to address lower throughput by putting pump stations on standby and modifying other facilities and operations so that the quantity of oil tendered to the pipeline system by the North Slope producers can be safely and economically transported. Those efforts to configure the pipeline to operate safely and efficiently will continue as production decreases even further over the coming decades. To effect these changes, Alyeska has instituted a phased Strategic Reconfiguration Program to develop integrated plans for all aspects of TAPS operations in the coming years.

By careful monitoring, planning, and adherence to planned maintenance strategies, Alyeska has kept — and will continue to keep — pace with aspects of the system which require attention. TAPS maintenance budgets are typically increased in proportion to the need for repair and replacement activities. However, maintaining the integrity of the pipeline system over the long term is manageable, with predictable dimensions and costs. Alyeska has the maintenance programs and resources to address current and future challenges.

8. Public Purpose

With respect to the "public purpose" criterion for renewal, TAPS clearly provides large — even essential — benefits to the public on a number of levels. Even before the creation of the pipeline system, Congress, in TAPAA, recognized TAPS to be "in the national interest" and important to the national security of the United States (43 USC §1651). Because TAPS currently transports 20 percent of the nation's domestically produced crude oil, and will continue to supply a significant percentage of that oil throughout the 30-year renewal period, its continued operation is vitally important to the economy of the United States. TAPS is particularly important to the State of Alaska and its local governments and citizens, since continued operation of the pipeline system contributes significantly to the economic well-being of the state.

TAPS has contributed billions of dollars to federal, state, and local governments, and will continue to do so. TAPS also provides substantial employment opportunities in Alaska (including rural Alaska). Other benefits the public derives from TAPS include improvements to Alaska's educational system (including the University of Alaska), improved road systems and hospitals, reduction of state tax burden, increased social services, and enhanced commercial development.

8.1 National Benefits

TAPS benefits the nation as a whole. The pipeline enhances the national security by providing a significant and reliable domestic supply of oil, and it contributes positively to the balance of trade.

Before construction, TAPS received designation under Title 1 of the Defense Production Act of 1950. This designation identified TAPS construction as being in the national interest and provided for TAPS to receive priority position in obtaining strategic materials from U.S. suppliers. The most recent classification of TAPS as an asset critical to our national security is derived from Presidential Decision Directive 63, which was approved in May of 1998. The directive states that certain national infrastructures (e.g., energy, information and communications, and banking and finance) are critical to the national and economic security of the United States and the well-being of its citizenry, and that the United States will take all necessary measures to protect them. TAPS is on the list of Critical Infrastructure.

By linking a significant portion of the nation's crude oil production (almost 20 percent) to market, TAPS helps significantly to reduce the rising trade deficit. Moreover, the nation has derived large economic and employment benefits from TAPS. Section 3.3.1.1 of the draft *Environmental Report for Trans Alaska Pipeline System Right-of-Way Renewal* (TAPS Owners, 2001) provides a more detailed look at these benefits, which are summarized as follows:

- From 1977 to 1988, Alaska North Slope production grew from 7 to 25 percent of domestic crude output. Even in 1998, ten years after reaching maximum output, Alaska North Slope output accounted for approximately 20 percent of U.S. crude production.
- Alaska North Slope output reduced the balance-of-trade deficit in crude petroleum by approximately $268 billion from 1977 to 1999.
- Alaska North Slope output contributed approximately $40.2 billion to the federal government in various taxes and royalties from 1977 to 1999.
- Alaska North Slope production has provided a market for U.S.-flagged tankers and jobs for U.S. seafarers. In 1999, for example, tankers in the Alaska North Slope trade accounted for 37 percent of the tonnage of the total U.S. seagoing tanker fleet (20 percent on a ship-count basis.)
- TAPS and associated North Slope oil fields provide a significant number of jobs in the Lower 48 in operating, maintaining, and supplying equipment critical to TAPS and North Slope operations.

These past benefits are expected to continue at significant levels throughout the 30-year renewal period.

8.2 State of Alaska Benefits

Petroleum production, transportation, and refining account for the largest basic-sector activity in Alaska. Most Alaskan oil production comes from the Prudhoe Bay region

on the North Slope, and all North Slope oil is transported by TAPS.

Most state revenues from production come from severance taxes and state royalties. However, both oil production and transportation contribute to the state property tax and the corporate income tax. Most revenues are deposited in the state General Fund, but part of the royalties and settlements go into special accounts, namely the Alaska Permanent Fund and the Constitutional Budget Reserve, established to save a significant portion of the revenues from the depleting North Slope petroleum fields.

The development of North Slope oil resources has contributed to the state economy through several mechanisms (These appear in more detail in Section 3.3.1.2 of the draft *Environmental Report for Trans Alaska Pipeline System Right-of-Way Renewal* [TAPS Owners, 2001]):

- Through 1998, about $42.6 billion (1998 dollars) was invested in production facilities on the North Slope.
- Data on total in-state procurement spending by the industry are not available, but oil industry wages paid in Alaska attributable to North Slope activities through 1997 were $12.4 billion in 1998 dollars. Payroll associated with TAPS operation through 1998, excluding contractors, totaled nearly $1.7 billion in 1998 dollars.
- After rapid growth in the early years, employment in the oil industry sector peaked in 1991 at slightly more than 9,000 workers but has been declining in recent years due to falling production and throughput. Current TAPS employment is 2,000, including both employees and contractors.
- Total annual expenditures for pipeline operations and maintenance, including special projects, have been several times as large as the annual payroll.

Continued operation of the pipeline and of North Slope oil- and gas-related activity generates a large and stable level of basic-sector employment that contributes to the economic base of communities throughout the state. Since these jobs are among the highest paid in the state, each job makes a large contribution to the economy. Many jobs linked to oil field operations, particularly in refining, module construction, air cargo, and government oversight, are located outside the pipeline corridor and the North Slope oil fields. In addition, most North Slope oil and gas workers live in other parts of Alaska.

North Slope oil activity increases the stability of the economy and reduces its seasonality. Since the Alaska economy is heavily dependent on natural resource production, it is particularly susceptible to economic "boom and bust" cycles. The stability and diversification of the economy provided by North Slope oil production reduce the frequency of economic cycles, and the state revenues from North Slope production give the state the ability to dampen those cycles, particularly in regions that depend on resources such as fishing and timber. Furthermore, pipeline operations and North Slope oil activity are not seasonal (compared to fishing, timber, tourism, and mining). This increases annual stability of employment and income, which in turn contributes to a larger support economy.

The continued operation of the pipeline and production of North Slope oil increase the options for the production of large crude oil reserves on the North Slope that currently are not technically feasible to produce. The existing North Slope infrastructure and the transportation link provided by the pipeline lower the cost of applying any new technology to these reserves.

Continued TAPS operation and North Slope oil production also increase the options for eventually bringing North Slope natural gas to market. In fields containing both crude oil and natural gas, sharing the production costs between oil and gas reduces the unit production cost of both.

8.3 Local Government Benefits

Revenues from the property tax on North Slope oil-production-related facilities and TAPS continue to be an important source of local government income. The North Slope Borough and the cities of Valdez, Anchorage, and Fairbanks all receive significant revenues from these sources. Other local property-tax revenues associated with oil refining, module construction, and air cargo rely on the continued operation of TAPS.

Photo 3. *Barrow, Alaska, is the farthest north community in the United States. Local government revenues from oil have provided funds for many community improvements.*

8.4 Citizens' Direct Benefits

Aside from oil-related employment, individual citizens benefit from TAPS in another way. Every Alaska resident receives an annual dividend check from the earnings of the Alaska Permanent Fund, an account established to save a portion of state petroleum royalties. The total dividend distribution in 1999 was about $1 billion, larger than the payroll of any of the basic industries of the state. The dividend is an important component of household income in every community in the state.

8.5 Conclusion

Continued operation of the Alaska North Slope oil fields and TAPS is expected to have significant positive economic impacts. Right-of-way renewal provides revenues to federal, state, and local governments, and employment and income for U.S. workers in Alaska and elsewhere. It also supports government policy objectives ranging from a national energy strategy to maritime policy.

Finally, renewal of the right-of-way preserves the pipeline and thus increases the possibilities for development of additional oil fields. In all these ways, continued operation of TAPS serves the public purpose.

9. Facility Cost

The facility cost of TAPS includes large past and recurring capital investments, as well as ongoing pipeline operating, maintenance, and repair costs. The rationale for including facility cost as a renewal duration criterion is presumably that, as the economic size of a project increases, the justification for longer-duration renewals becomes stronger. Both the federal MLA and the state Right-of-Way Leasing Act authorize rights-of-ways for every size and type of project. As one of the largest construction projects ever built in the United States, with immense continuing capital and operating budgets, TAPS clearly qualifies under the cost criterion for the maximum renewal period. The maximum permissible renewal duration period also provides an essential and beneficial stimulus to continued large investments in the pipeline, the associated marine transportation system, Alaska North Slope oil development, and numerous support industries in Alaska, such as oil refining, and rail and truck transportation. A shorter renewal period would signal a lack of confidence in the continued operation of the pipeline system, and might well chill further investment in Alaska, which must compete in a worldwide market for oil development funds and projects.

TAPS cost approximately $8 billion (in 1977 dollars) to construct. Over its life span, additional project expenditures have been made in the amount of approximately $3 billion (1998 dollars). Operating and maintenance costs have averaged over $400 million (1998 dollars) per year. Table 3.3-4 of the draft *Environmental Report for Trans Alaska Pipeline System Right-of-Way Renewal* (TAPS Owners, 2001) provides more detail on these costs. Costs are predicted to continue at significant levels throughout the 30-year proposed renewal period. Significant capital expenditures in the system will also be required, although their amounts and years of occurrence are not predictable.

10. Other Factors in Setting Duration

Three other factors should be taken into consideration in determining the renewal period. First, there is no legal reason for the grant of a renewal period shorter than the maximum. As noted, TAPS is extraordinarily well regulated and flexibly governed under a complex series of laws, regulations, and contractual provisions that do not require the renewal of the Federal Grant and State Lease more frequently than every 30 years. The best evidence of this fact is that the existing Grant and Lease have functioned quite adequately and have proven to pose no barrier to the reasonable imposition of new and modified requirements where changed circumstances or new requirements have arisen. There is little need to change either the fundamental terms or the duration of these agreements.

Second, the right-of-way renewal process is itself very costly in both direct expenditures and in the private and public resources that it consumes. The TAPS Owners, the JPO, and other agencies will have to devote very significant staff as well as other resources to the process. If the renewal process were the sole effective means to examine the operations of TAPS, perhaps requiring a renewal more frequently than 30 years might be justified. However, every aspect of TAPS is regularly subjected to thorough oversight and review by the regulatory community and affected public. Since the costs of the renewal process are so high, and the results, if any, largely duplicate other reviews, there is no reason to engage in this process any more frequently than at the maximum permissible interval.

Lastly, even if TAPS were to cease operations before the end of a 30-year renewal period, there is no negative consequence, since federal and state law provides for the relinquishment of the right-of-way in the event the pipeline ceases to operate or violates fundamental requirements.

John Warden for BP Exploration (Alaska) Inc.

Photo 4. *Elevated pipeline (left) and the Dalton Highway (right) in the Brooks Range.*

11. Conclusion: Justification for 30-Year Right-of-Way Renewal

One of the key variables in the right-of-way renewal decision is the length of the renewal period. This report indicates that TAPS can, and is expected to, continue operating as a crude oil pipeline and remain economically viable for at least 30 more years. TAPS well satisfies the useful life, public purpose, and cost criteria for a long-term renewal. Federal law and, with modification, state law will permit a 30-year renewal period. Since there are strong reasons for a maximum-term renewal, the length of the renewal term should therefore be set at 30 years to accommodate the transportation of remaining economically recoverable North Slope crude oil to market, supporting, in the bargain, the economic and strategic interests of the nation and the State of Alaska. Just as 30 years was the appropriate term in 1974, it also is the appropriate term now.

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